PB

RESTRICTED CIRCULATION.

This paper is not an official document; it is for information only and must not be quoted in any printed publication:

Forecasting 'wind chill' in lambs - Spring 1980.

Agricultural Memorandum No. 891.

Estimates of the 24-hour cumulative heat loss likely to lead to mortality in neo-natal lambs in a lowland flock were made in Ag Mem 865 on the basis of several years field studies. A scheme for forecasting a 'wind-chill' index for Spring 1980 was devised in co-operation with Mr Pettit, S.Met O Benson, S. Met O, Upavon and Mr Bishop, manager of Bradfield Farm. (Appendix 1).

Benson were requested to make a 24-hour forecast of lamb-wind chill using forecasts at Bradfield of wind, temperature and the occurrence (or not) of precipitation during 6 four-hourly periods. Mr Pettit visited the farm in February to see if local topography etc need to be taken into account for the forecasts.

The wind-chill index was estimated daily using tables 1 and 2 and made available by 0900Z for Mr Bishop to receive by telephone. The initiative for 'collecting' the indices was left to Mr Bishop who, on the basis of the forecast made the decision whether to put out the young lambs or retain them for a further period within the covered lambing area. (Weekends and public holidays were covered by Upavon, Appendix 3).

Forecast and 'actual' indices for Benson are presented in Appendix 1 and Fig 1 (the latter also indicating the Upavon forecasts). Forecast ranges of indices generally either encompassed the actual or erred on the 'safe' side - implying an overestimate of the number of 'wet' periods. Only the stress forecast for the 28th March was underestimated (at 76 units) compared with the actual index of 93 units, due to rainfall occurring on 5 out of the 6 periods compared with the forecast 2 out of 6. (the importance of a wet coat in increasing heat loss is apparent from tables 1 and 2).

(1123)

Mr Bishop apparently found this forecasting of a stress index a valuable guide on his lamb management decision especially as Benson combined a consultative element as well as giving the index so that Mr Bishop could judge the possibility of forecast timing errors and their effect on the index and his decisions.

Any comments or suggestions on this paper to be referred to the author.

J R STARR
Meteorological Office
MAFF, Reading
July 1980

Appendix 1.

FORECASTING 'WINDCHILL' IN LAMBS - MARCH AND APRIL 1980

Young lambs can be greatly stressed by adverse combinations of windspeed and temperature particularly when WET. The loss of body heat in bad weather can, if the lamb is unable to restore adequate energy reserves by suckling, lead to hypothermia, a decreased desire to feed and eventually death.

The procedure given here represents an attempt to estimate when this critical heat loss is likely to be exceeded over 24 hours; it may over-estimate the heat loss in showery situations since the assmuption is made that 'rain' signifies precipitation for all or at least the greater part of a 4-hour period.

Procedure

a. Over each of the 4-hourly periods beginning 0800 each day a SCORE is allocated depending on the forecast average 10 m windspeed, temperature and likelihood of precipitation at Bradfield Farm near Reading - SEE ACCOMPANYING TABLES. (You will see that higher scores occur in wet, windy, cold periods; it has to be extremely windy and cold to chill a dry lamb).

b. Add the six SCORES to give the forecast 24-hour heat loss factor H.
If H > 95 conditions may be CRITICAL.

H:	90 to 94	Danger
H:	80 - 89	Warning
H:	< 80	Green

1

WET

Wind, Knots at Bradfield. \ Temp °C	> 5	+5 to 0	0 to -5	< -5
> 20	17	18	19	20
10 - 20	16	17	18	19
< 10	14	15	16	17

2

DRY

Wind \ Temp °C	> 0	0 to 5	< -5
> 20	12	13	15
10 - 20	11	12	13
< 10	10	11	12

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 17-3-80 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature dg C.	4	4	1	1	0	0	X
Forecast wind speed knots	12	12	5	5	5	10	X
Rain ?	Yes/~~No~~	~~Yes~~/No	~~Yes~~/No	Yes/~~No~~	Yes/~~No~~	Yes/~~No~~	X
Forecast Stress Factor	17	11	11	15	15	17	(86)
Actual Stress Factor	3-4 C 8-12 KT WET 16	2-5C <10KT WET 15	5-3 C <5KT DRY 10	1-2C <8KT DRY 10	1-2C <10 KT DRY 11	1-2C <10KT WET 15	77

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 18 MARCH 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature dg C.	+2	+4	+3	+2	+1	0	X
Forecast wind speed knots	12	15	15	15	12	10	X
Rain ?	Yes/No YES	Yes/No YES	Yes/No YES	Yes/No YES	Yes/No NO	Yes/No NO	X
Forecast Stress Factor	17	17	17	17	17	16	101
Actual Stress Factor	1-5C >10KT WET 17	5-7C 10-20KT WET 16	7-5C 10-20KT WET/DRY 16	5C 10-20KT DRY/W 11	3C 15KT WET 17	2C 15KT+ WET 17	94

Appendix 2

[6]

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 19 MARCH. 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature dg C.	02.	03	02	01	01	01.	X
Forecast wind speed knots	20	20	20	20	20	20	X
Rain ?	Yes/~~No~~	Yes/~~No~~	Yes/~~No~~	~~Yes~~/No	~~Yes~~/No	~~Yes~~/No	X
Forecast Stress Factor	17	17	17	11	11	11.	(84.)
Actual Stress Factor	2C 18KT WET 17	2C 18KT WET 17	2C 18KT DRY 11	1-2C 18KT DRY 11	1C 20KT DRY 11	+0 18KT DRY 11	78

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 24 MARCH 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature dg C.	Ps 7	Ps 8	Ps 6	Ps 4	Ps 3	Ps 2	X
Forecast wind speed knots	13	15	12	8	5	5	X
Rain ?	Yes/No YES	Yes/No YES	Yes/No YES	Yes/No NO	Yes/No ~~NO~~ YES	Yes/No NO	X
Forecast Stress Factor	16	16	16	10	15	10	83
Actual Stress Factor	7 15 WET 16	10 12 ▽ 16	9 14 ▽ 16	7 11 ▽ (1) 16 (11)	6 8 ▽ (1) 16 (10)	4 6 DRY 10	90 (79)

Passed to John Bishop
Bradfield Hotel
0845 ~~Z~~ 220710Z

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 25 MARCH 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature deg C.	+7	+9	+8	+6	+5	+4	X
Forecast wind speed knots	12	12	10	8	8	6	X
Rain ?	~~Yes~~/No NO	Yes/~~No~~ YES	Yes/No YES	Yes/No YES	Yes/No NO	Yes/No NO	X
Forecast Stress Factor	11	16	15	14	10	10	76
Actual Stress Factor	+5-10 10-13KT No 11	10+ 12-17KT ▽ 16	10-6C 10+ ▽16	6-4C 10-6KT ▽14	4C 7-3KT NO 10	3C 5 KT NO 10	77

Passed to John Bishop
25/0830Z.

[7]

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 26/3/ 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature deg C.	PS 08	PS10	PS 10	PS 09	PS08	PS 06	X
Forecast wind speed knots	7	12	17	17	12	10	X
Rain ?	Yes/~~No~~ DRY	Yes/~~No~~ DRY	Yes/~~No~~ DRY	Yes/~~No~~ WET	Yes/~~No~~ WET	Yes/~~No~~ WET	X
Forecast Stress Factor	10	11	11	16	16	16	(79)
Actual Stress Factor	10	11	11	17	12	16	80

[8 31]

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 27/3/80. 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature deg C.	10 12	10 11	10 9	7 7	7 6	7 7	X
Forecast wind speed knots	15 15	12 15	10 12	10 8	10 4	10 10	X
Rain ?	Yes/~~No~~ YES.	Yes/No NO	Yes/No DRY YES	Yes/No DRY YES	Yes/No YES	Yes/No YES.	X
Forecast Stress Factor	16 ✓	11	14	14	14 ✓	14 ✓	(83)
Actual Stress Factor	16	16	11	10	14	14	(81)

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 28-3-80 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature deg C.	12	10	8	6	6	6	X
Forecast wind speed knots	13	18	15	15	15	15	X
Rain ?	Yes/No YES	Yes/No NO	Yes/No NO	Yes/No NO	Yes/No NO	Yes/No YES.	X
Forecast Stress Factor	16	11	11	11	11	16	(76)
Actual Stress Factor	8-12 7-14 YES 16	10-12 15-22 YES 16	10-7 20 ▽ 16	7 20+ YES 17	7 20+ YES 17	7 10+ NO 11	93

46
27

8

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Dates: 31-3- 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature dg C.	8	10	10	10	10	06	X
Forecast wind speed knots	13	15	15	15	13	10	X
Rain ?	Yes/~~No~~	Yes/~~No~~	~~Yes~~/No	~~Yes~~/No	~~Yes~~/No	~~Yes~~/No	X
Forecast Stress Factor	16	16	11	11	11	11	(76)
Actual Stress Factor	7 9 Y 14	10 12 Y 16	10 10 Y 16	11 10 N 10	10 8 Y 14	9 7 N 10	80

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Dates: 1 APRIL 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature dg C.	10 11	11 10	10 08	9 4	6 4	4 4.	X
Forecast wind speed knots	8 ✓	8 ✓	12 17	12 10	8 8	6 12.	X
Rain ?	Yes/No NO	Yes/No NO	Yes/No YES	Yes/No YES NO	Yes/No NO NO	Yes/No NO NO	X
Forecast Stress Factor	10	10	16	16	10	10	72
Actual Stress Factor	10	14	16	11	10	10	(71)

Collected by John Bishop
01 1130 Z

(5)

[9]

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 2ND APRIL 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature deg C.	08	10	9	6	3	3	X
Forecast wind speed knots	13	16	13	08	05	03	X
Rain ?	~~Yes/No~~	~~Yes/No~~	~~Yes/No~~	~~Yes/No~~	~~Yes/No~~	~~Yes/No~~	X
Forecast Stress Factor	11	11	11	10	10	10	(63)
Actual Stress Factor	11	11	11	10	10	10	63 ✓

[10]

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 3 APRIL 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature deg C.	+7	+12	+9	+5	+2	MSI	X
Forecast wind speed knots	6	8	6	3	CALM		X
Rain ?	Yes/No NO	Yes/No NO	Yes/No NO	Yes/No NO	Yes/No NO	Yes/No NO	X
Forecast Stress Factor	10	10	10	10	10	11	61
Actual Stress Factor	10	10	10	10	10	11	61 ✓

Passed to John Bisley
: 03/07267

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs at Rushall Farm, Bradfield, Berkshire March/April 1980.

Date: 4 APRIL 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature deg C.	Ps 5	Ps 12	Ps 08	Ps 04	Ps 02	Ms 0.1	X
Forecast wind speed knots	< 10	< 10	< 10	< 10	< 10	< 10	X
Rain ?	Yes/No NO	Yes/No NO	Yes/No NO	Yes/No NO	Yes/No NO	Yes/No NO	X
Forecast Stress Factor	10	10	10	10	10	11	61
Actual Stress Factor	1-9c < 10 NO 10	10+ < 10 NO 10	10+ < 10 NO 10	5-10 < 10 NO 10	4-2 < 10 NO 10	0-2 < 10 NO 10	60

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs at Rushall Farm, Bradfield, Berkshire March/April 1980.

Date: 8-4- 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature deg C.	08	10	06	05	04	05	X
Forecast wind speed knots	11	13	11	08	04	04	X
Rain ?	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	X
Forecast Stress Factor	~~10~~ 11	11	11	10	10	10	63
Actual Stress Factor	5-8 10+ DRY 11	9 12-15 DRY 11	8 14-8 DRY 11	6-3 < 10 DRY 10	3 < 10 DRY 10	2 < 10 DRY 10	63

[11]

Meteorological Office R.A.F. Benson

Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 9 APRIL 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature dg C.	8 ✓	11 ✓	9 ✓	8 ✓	6	4	
Forecast wind speed knots	8 ✓	10+ ✓	7 ✓	7 ✓	5	5	
Rain ?	Yes/No NO	Yes/No NO	Yes/No NO	Yes/No NO	Yes/No DRY SLT POSSIBLE	Yes/No NO	
Forecast Stress Factor	10	11	10	10	14	10	65
Actual Stress Factor	10	11	14	10	10	10	65 ✓

[12]

Meteorological Office R.A.F. Benson

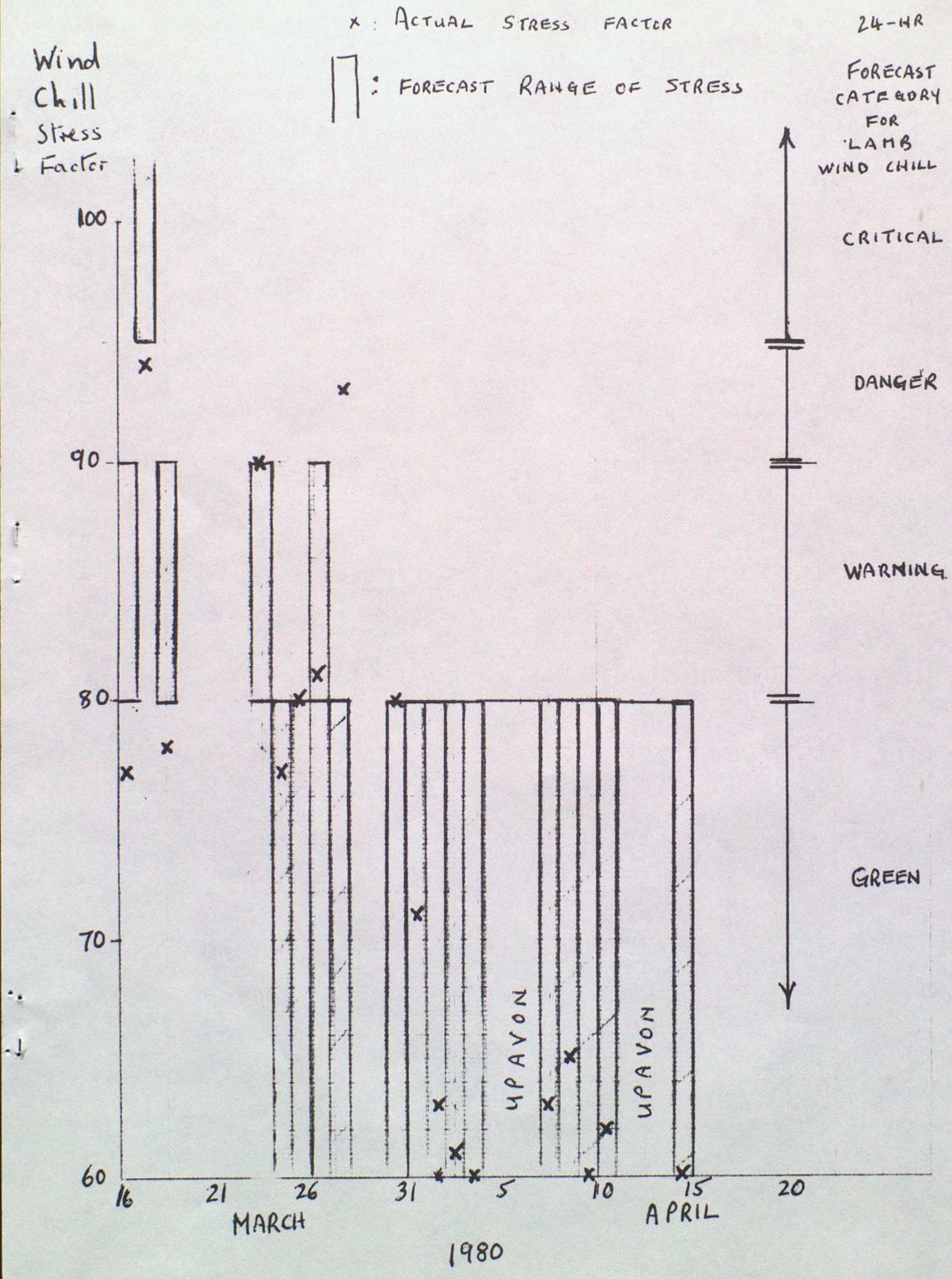
Forecast 'Windchill' stress factors for newborn lambs
at Rushall Farm, Bradfield, Berkshire
March/April 1980.

Date: 10-4-80 1980

Period L.T.	0800 to 1200	1200 to 1600	1600 to 2000	2000 to 2400	0001 to 0400	0400 to 0800	TOTAL
Forecast Temperature dg C.	08	11	7	5	3	3	
Forecast wind speed knots	11	11	7	4	0	0	
Rain ?	~~Yes/No~~	~~Yes/No~~	~~Yes/No~~	~~Yes/No~~	~~Yes/No~~	~~Yes/No~~	
Forecast Stress Factor	11	11	10	10	10	10	(62)
Actual Stress Factor	7-10 <10 DRY 10	10-12 <10 DRY 10	12-8 <10 DRY 10	8-4 <10 DRY 10	3-1 <10 DRY 10	3 <10 DRY 10	60 ✓

Wind-Chill Forecasts
Benson 1980

Fig 1



Appendix 3

T
84815l MAFRED GZCZC
FROM METEOROLOGICAL OFFICE UPAVON

FOR METEOROLOGICAL OFFICE ADAS MAFF READING ATTENTION MR J.STARR

LAMBING FORECASTS ISSUED FOR BRADFIELD FARM APRIL 1980.

FORECASTS ISSUED BY UPAVON.

05 APR.
ANTICYCLONE ALMOST STATIONARY OVER THE BRITISH ISLES. FINE AND DRY. SUNNY BY DAY(MAX TEMPERATURE 12 DEG C). CLEAR SKIES TONIGHT, MINIMUM TEMPERATURE NEAR ZERO DEG C, WITH GROUND FROST IN SHELTERED PLACES.
FOR 24 HOURS, WIND LESS THAN 10 KT, TEMPERATURE OVER 0 DEG C. DRY.
INDEX 6X10=60.

06 APR.
ANTICYCLONE CENTRED BORDERS ENGLAND/SCOTLAND. LONG CLOUDY SPELLS THIS MORNING, SUNNY PERIODS THIS AFTERNOON AND EVENING.
CLEAR SPELLS TONIGHT WITH GROUND FROST. INDEX=63.

07APR.
DRY TODAY, POSSIBLE OCCASIONAL LIGHT RAIN DUSK TO MIDNIGHT, THEN DRY. WINDS LIGHT BECOMING MODERATE NORTHWESTERLY. INDEX=71.

12 APR.
WEATHER SUNNY AND DRY, BUT WITH MODERATE TO FRESH SOUTHEASTERLY WIND. CLEAR TONIGHT. MAX 15 DEG C, MIN 05 DEG C. INDEX 69.

13 APR
SUNNY PERIODS, DRY, FRESH OCCASIONALLY STRONG SSE WIND TODAY. CLOUDY BUT DRY THIS EVENING. SOME OUTBREAKS OF RAIN POSSIBILE DURING THE NIGHT. MINIMUM AIR TEMPERATURE PS 09 DEG C.
INDEX=72.

NOTE.

SOME OF THE ABOVE FORECASTS WERE NOT COLLECTED.

TOD 28/1530Z

WEATHERUPAVON

47187 WEAUPA G
84815l MAFRED GO